Appendix 4. Napa Plant Site Monitoring Plan

AppendixA: Monitoring and Adaptive Management Plan (MAMP) for the Napa Plant Site (NPS)

MONITORING

This appendix discusses the monitoring plan for construction and habitat evolution at the NPS and includes the parameters; performance standards; hypothesized habitat targets, protocols; and frequencies for the North, Central, and South Units. The monitoring methods, schedule, and reporting system are also described in the attached Appendix A Table A-1 Napa Plant Site Monitoring: Parameter, Performance Objective, Protocols, and Frequency.

1.0 Background

This monitoring plan was developed to track the progress of the project with input from the Water Board staff and the Bay Area Monitoring Review Team (MRT), which met on May 15, 2006 to discuss the monitoring plan for the project. Monitoring also includes items identified in the Final Environmental Impact Report (e.g., avian monitoring in the North Unit for bird strike hazard evaluation). In addition, the Water Board suggested using other salt pond restoration project monitoring plans as examples to maintain a level of consistency among projects. Two projects in particular were suggested as appropriate models because they were breached in 2006: the NSMRP located near the NPSR project, and the Island Ponds (A19, A20 and A21) in the South Bay. However, it should be noted that the island ponds are mitigation for a Santa Clara Valley Water District project(s), whereas, the NPSR project is purely for restoration purposes and is not driven by a regulatory mandate.

1.1 Monitoring Components and Performance Objectives

Over a 15-year period, chemical, physical, and biological project components will be monitored for each phase of the restoration project. In addition, aerial photos will continue to track tidal marsh development every 5-10 years until the final objective of tidal marsh is achieved (defined here as having 75% cover of native tidal marsh plant species).

1.2 Chronology

Project construction will be completed in two or three phases. The construction of each phase will be considered complete when tidal action has been restored and all grading and site improvements associated with that phase are finished. After each phase has been completed the Department of Fish & Game (DFG) will submit a construction completion report (with as-built drawings) to the Corps, Water Board, and BCDC. Upon approval of these reports (or after 45 days from submission), the monitoring period will commence. Monitoring requirements for Phase 2 may be modified based on Phase 1 results and lessons learned.

2.0 Monitoring Methods and Schedule

This section presents monitoring protocols for water quality, biota, and geomorphic evolution. The monitoring schedule is also discussed and summarized in Table A-1 .

2.1 Water Quality.

This section discusses general water quality parameters and mercury.

General Water Quality Parameters: The water quality monitoring is specifically associated with project construction to assess the effects of breaching on the receiving water quality. General water quality parameters to be monitored include salinity, temperature, pH, DO, and turbidity. General water quality parameters will be monitored *in situ* by collecting a grab sample and using a multi-parameter probe and flow cell (e.g., YSI 6820 or equivalent) to measure parameters. Figure A-1 shows sampling locations and designates which locations are associated with each construction phase. Monitoring stations are associated with each breach and the receiving water downstream of the breach (i.e., in the Napa River). The sampling station locations will allow assessment of pond effluent and receiving water quality, as well as estimation of attenuation of any water quality conditions that may exists (e.g., salinity plumes or low DO concentrations).

Water quality data will be collected at one foot below the surface during an ebbing tide. Data will be collected at the following frequency:

- Within 3 days prior to breaching of the pond levees
- Once during the first 24 hours after breaching, and again within 5 days after the breaching.
- Weekly for the first month after breaching
- Monthly until water quality performance objectives have been met for three consecutive months

Water quality monitoring data will be evaluated for trends and compared to the performance objectives established for each parameter.

Mercury: Water and sediment will not be monitored post construction for mercury because the Water Board is amending the mercury objective (Water Quality Control Plan for the San Francisco Bay Region as amended August 9, 2006). The mercury objective is expected to be based on fish tissue mercury concentrations. DFG has requested that the CBDA Biosentinel Mercury Monitoring Program BMMP) add a sampling station within the Napa Plant Site project area. If the BMMP cannot conduct this monitoring then DFG will follow the BMMP fish collection and mercury analysis protocols. One station will be established in the North Unit. Sampling will be conducted at least biennially (every other year) and annually if funding is available. Once the South Unit is breached the North Unit data will be analyzed to determine if a station should be established in the South Unit.

2.2 Biota

This section discusses biological monitoring, including avian monitoring, fish as used for biosentinel mercury monitoring, small mammals, and vegetation.

Birds

Avian surveys will be conducted quarterly in the North Unit (Ponds 9 and10) and as follows in the Central and South Units: twice a year in years 1-3; once a year in years 4-7, 10 and 15 or until vegetation cover reaches 80 percent and the predominant bird use shifts from shorebirds and waterfowl to resident marsh species. Surveys will continue for approximately 1 year thereafter or for a maximum period of 15 years following completion of each project phase. The greater frequency of monitoring in the North Unit is a mitigation measure that will provide data needed to evaluate bird strike hazards associated with the Napa County Airport, and guide adaptive management decisions. Bird surveys will be conducted using the USGS point count protocol. DFG may choose to monitor California Clapper Rails when the appropriate habitat has developed.

Data from United States Geological Survey (USGS) bird surveys conducted at the project site between April 2003 and March 2006 will be used as a baseline for comparison of data collected in the post-project monitoring period. Data analysis will include an evaluation of species composition, abundance and trends in bird use. DFG will coordinate with the Napa Solano Audubon Society to add a Christmas Bird Count Station at the Napa Plant Site.

Fish

DFG will coordinate with regional programs to conduct biosentinel fish monitoring at the Napa Plant Site (see mercury section above). Monitoring would occur at one location once per year in each wetland restoration Unit.

Small mammals

Tidal marsh habitats can support populations of special-status small mammals, including salt marsh harvest mouse (*Reithrodontomys raviventris*) and Suisun ornate shrew (*Sorex ornatus sinuosus*). It is DFG's responsibility as a state agency to make efforts toward the conservation and recovery of these species. Thus, DFG will monitor or document the presence or absence of state listed small mammals at the project site in accordance with the established state wildlife conservation and recovery programs. This monitoring will commence once appropriate habitat has developed.

Vegetation

Vegetation colonization in wetland areas will be monitored using aerial photography supported by ground-truthing. Aerial images will be interpreted with a Geographic Information System (GIS) to estimate percent cover in the wetland areas. Ground-truthing will be performed to verify vegetation signature on the aerial photos, and to make qualitative assessments of species richness and community composition. Vegetation assessment will be conducted separately for each project planning unit i.e., cover, species richness and composition will be analyzed separately for the North, Central and South Units. Vegetation assessment will commence for each planning unit when aerial imagery or ground-based observations suggest that the cover is approximately 20 percent. Prior to reaching the 20% level, the dominant pioneer species colonizing the marsh plain will be noted.

Invasive non-native plant species that threaten sensitive native tidal marsh communities should be kept off the site to the extent feasible, including those listed under Tier I (and to a lesser extent Tier II) of the Water Board's "Invasive Non-Native Plant Species to Avoid in Wetland Projects in the San Francisco Bay Region"[1] DFG will review this list and discuss with Water Board staff which species will be feasible to keep off the wetland restoration site, and which will not. Invasive cordgrass (*Spartina alterniflora*) is a high priority to keep out of tidal wetland restoration sites in the North Bay and DFG should coordinate with the Invasive Spartina Project to control this species.

Aerial photography will be coordinated with the NSMRP to maximize the cost-effectiveness and efficiency of monitoring. Photography may be taken using aircraft mounted cameras in conjunction with DFG waterfowl counts. Images may be slightly oblique (not ortho-rectified), however these images should be adequate for estimating vegetation cover on the ponds.

2.3 Geomorphic Evolution

Protocols developed by the San Francisco Estuary Institute for mapping vegetation using aerial and satellite photos will be reviewed and followed if feasible[2]. Some form of habitat mapping including vegetation types and channel evolution will be conducted using aerial or satellite photos obtained from DFG's planes or other source such as Google Earth, if those provide sufficient detail to assess the development of habitats including channels.

2.3.1 Tidal Channel Evolution

Evolution of tidal channels will be evaluated using aerial imagery. The aerial images will be captured biennially during a spring low tide to increase channel network visibility. Aerial images will be interpreted with GIS to calculate: 1) overall channel density in the drainage basin associated with each breach; 2) channel width at each breach and at locations along the alignment of the constructed channels. The cross-section locations are shown in Figure A-1. Density will be calculated as square feet of channel per square feet of marsh plain.

Restoration of tidal action to the North Unit will increase the tidal prism in Fagan Slough and may result in erosion of the adjacent marsh plain. Monitoring of Fagan Slough erosion is not a regulatory requirement, but has heuristic value with regard to documenting the effects of restoring tidal action. Bank scour of Fagan Slough will be evaluated using aerial imagery and field measurements. Permanent markers will be placed on the marsh plain at 50-meter off-sets from the edge of Fagan Slough. The distance from the markers to the edge of slough will be recorded in years 2, 5, 10, and 15.

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[1] (www.waterboards.ca.gov/sanfranciscobay/certs.htm under "Fact Sheet for Wetland Projects, Appendix I).

[2] In addition to protocols for tidal marsh vegetation mapping from aerial and satellite imagery, this site also has protocols for monitoring tidal marsh plants and animals, as well as sedimentation rates. (see www.wrmp.org/documents.html; under "Protocols".

2.3.2 Sedimentation **[**

Sedimentation in restored tidal areas will be monitored using sedimentation plates, pins, erosion tables or Lidar. If sedimentation plates are used, each plate will be constructed of a square sheet of non-corrosive material. Sedimentation plates will be set flush with the marsh surface prior to restoration of tidal action. A rod will be placed through the center to anchor the plate and facilitate relocation. Sedimentation plates will be placed in the North, Central and South Units (Figure A-1). Sedimentation plates are placed close to the perimeter levee points to facilitate safe access by DFG staff. Sediment accumulation on the plates will be measured in years 2, 5, 10, and 15. A total of 6 plates will be placed on the site before tidal action is restored, but only 3 of those need to be measured regularly; the remaining 3 can be kept in reserve for measuring, in case the predicted deposition fails to produce elevations at which vegetation develops.

3.0 Reports

As-built plans will be submitted to the Corps, BCDC, and the Water Board within 90 days of the completion of construction. The plans will note changes from the final bid set of plans and will be accompanied by notes from the construction manager and monitor.

Monitoring reports describing the data collected pursuant to the approved restoration plan shall be submitted biennially (every two years) beginning on December 1st, for 15 years post-construction of each phase. In addition to submitting the biennial monitoring reports, DFG may voluntarily submit informal memo reports in the interim years. However, if limitations due to budget restraints and personnel limitations become unmanageable for DFG to submit informal memo reports in a given year, DFG will postpone the submission of the informal memo report for that given year. Biennial post-construction monitoring reports will include monitoring results, analysis of quantitative monitoring data, an evaluation of performance objectives, and suggested corrective actions. The report will include photographs and figures identifying monitoring station locations and photo points. The monitoring report will include a list of the names of the persons who conducted the monitoring and prepared the report. Results of the water quality sampling will be presented in the 1st year. Trend analysis of sedimentation, tidal channel evolution, and vegetation colonization will begin in the Year 3 report. All reports will evaluate and discuss bird use. Monitoring reports will include details of any adaptive management actions that have been implemented in the preceding year. Monitoring reports will be submitted to the Corps, the Water Board, BCDC, USFWS, Caltrans Aeronautics and Napa County (Airport and Department of Public Works).

The monitoring and reporting schedule is shown in Table A-1.

4.0 Notification of Completion

DFG shall notify Corps, BCDC, and the Water Board at the end of the 15-year monitoring period, or when the performance objectives have been met. A site visit to confirm completion status will be scheduled. The hypothesized target of 75% cover of native tidal marsh plant species may not occur for 70 years or longer. DFG will attempt to analyze habitat development

and report to the agencies every 5-10 years on the development of the site toward meeting that target.

5.0 Contingency Measures

Corrective actions, if necessary, will be suggested in biennial monitoring reports for performance objectives that are not being met. The responsible party for implementing and monitoring required contingency measures is the California Department of Fish and Game, represented by:

Larry Wyckoff, Habitat Conservation Manager
7329 Silverado Trail
Napa, CA 94558
707.944.5542
fax 707.944.5563
lwyckoff@dfg.ca.gov

6.0 Maintenance

The proposed project design minimizes operations and maintenance requirements, particularly because no water control structures are included. Tidal restoration is self-sustaining and evolves to a dynamic equilibrium state without intervention. The project would require operation and/or maintenance of the following:

- Perimeter levees
- Public access features including the boat launch, trails, restrooms, and interpretive signs
- Parking area and site access road

Perimeter levees will be inspected for erosion, settlement, excessive burrowing animal activity, and/or presence of deep-rooted woody plants. Maintenance would be performed to address problems. Public restrooms and trash receptacles would also require regular maintenance. The parking area and the site access road may require grading or placement of additional road base material.

7.0 Adaptive Management

The ability to react to changing circumstances is the basis for adaptive management. The adaptive management premise is to addresses issues as they arise; developing solutions based on contemporary circumstances and available resources. Issues that may require adaptive management include mosquito abatement, invasive species, bird strike hazards, erosion, flooding, and others. DFG will develop solutions to management needs as they arise. DFG will utilize a Technical Advisory Committee (TAC) to discuss adaptive management measures, particularly in regard to bird strike hazards. The TAC will include DFG staff, resource agency staff from the Water Board, BCDC, the Corps, Napa County, and other interested agencies and the public. . The TAC will meet once every 2 years or more frequently, if necessary. Lessons learned from Phase 1 construction and management will inform Phase 2 final design and management.

Table A-2
Maintenance and Adaptive Management Schedule

Years Following Construction	Maintenance and Adaptive Management Activities
Years 1 and 3	Avian Activity Evaluation Levee and road inspection Technical Advisory Committee meetings, as needed
Years 5, 7 and 10	Levee and road inspection Technical Advisory Committee meeting, as needed
On-going	Levee and road inspection and maintenance Public access and facilities maintenance

Avian Management

The TAC will review bird strike data and determine if adaptive management measures are needed. Specifically, the TAC will discuss implementation options if the Relative Hazard Score of birds using the North Unit increases and bird strikes appear to be associated with birds using the North Unit. The TAC will suggest the types of adaptive management measures to be implemented. Adaptive management measures could include avian control techniques (e.g., habitat exclusion, repellent and harassment) identified in the FAA *Wildlife Hazard Management at Airports* publication (Cleary and Dolbeer 2005). Monitoring will be conducted to determine if adaptive management measures achieve the desired outcome.

Mosquito Abatement

As vegetation becomes established on the site potential mosquito habitat may increase. During the time that the site is at or below MHW it is predicted to drain well, even as vegetation begins to establish. The South Unit marsh plain is predicted to be at MHW at approximately 65-75 years after breaching. This mature marsh plain has potential to include isolated pools and shrink/swell cracks surrounded by vegetation, which could serve as mosquito breeding habitat. The areas most likely to provide mosquito habitat in the near term are the existing transfer and brine ditches. When the ditch's salt concentration decreases and water stops flowing through them then they have the potential to be larval mosquito habitat. The project would lower the levees adjacent to these ditches, using the excess material to fill or partially fill the ditches, thereby enhancing ditch drainage and decreasing mosquito habitat. These levees would also be breached in numerous locations to facilitate drainage. The perimeter levees would facilitate Napa County Mosquito Abatement District's treatment procedures by providing good perimeter access to the tidal marshes and perimeter drainage ditch. In addition, the boat-launching ramp in the barge channel provides aquatic access.

Sampling locations are shown on the attached Figure A-1.